DEPARTMENT OF DEFENSE

DoD Enterprise Architecture Reference Model

Lessons Learned

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By

DoD EA Congruence Community of Practice

Feasibility of Aligning DoD EA with the FEA
Seventeen Lessons Learned

Introduction:

The DoD Enterprise Architecture Reference Model (DoD EA RM) is a business and performance-based framework for cross-organization, DoD, and government-wide improvement. It provides DoD with a new way of describing, analyzing, and improving Information Technology (IT) governance and DoD's ability to improve services for the citizen by better aligning enabling IT with the expected mission outcomes of the Department. Further, such a set of RMs fosters cross-DoD collaboration, and enterprise process improvement. RMs, when used to organize large amounts of EA information, increase the potential for the success of the Secretary's transformation goals and the initiatives of the President's Management Agenda.

Led by the Office of the DoD Chief Information Office (CIO) in conjunction with the DoD Components and the Business Modernization Management Program (BMMP), the DoD Enterprise Architecture Congruence Community of Practice (DoD EAC CoP) was formed. The primary objective of the CoP was to figure out how, if at all, the DoD enterprise work that is related to capability, IT investments, and acquisitions could be aligned with the Federal Enterprise Architecture Reference Models (FEA EA RMs). A secondary objective was to determine whether definitions could be aligned between the DoD and FEA definitions.

Key Questions:

1. Can DoD EA information be aligned with the FEA?
2. What can be learned about the maintenance of the DoD EA RMs
3. What use do the RMs have and to whom?
4. How should the RMs be governed?

Lessons Learned

1. Can DoD EA information be aligned with the FEA?

   Lesson #1. DoD EA information can be aligned with the taxonomy and vocabulary of the FEA RMs. The DoD EAC CoP met regularly for nine months in Fiscal Year (FY) 2004 to assess and demonstrate the feasibility of aligning DoD information with the FEA RMs. As a result, the DoD EAC CoP determined that the alignment was feasible. This alignment was published in Version .03 (V.03) DoD EA RMs in the spring of calendar year 2004. During the first six months of FY2005, the DoD EAC CoP met regularly to document the changes to alignment for V.04 of the DoD EA RMs and to assess the impact changes would have on maintaining the RMs. V.04 will be published during the

summer of calendar year 2005. The RMs may be seen at http://www.dod.mil/nii/; Click on "Others".

Lesson #2. An agreed-upon DoD EA RM taxonomy and vocabulary is needed to most effectively utilize the alignment of DoD information with the FEA RMs. Such an agreed upon taxonomy and vocabulary allows DoD to clearly articulate the relationships of its business, service components, technologies, data, and IT performance metrics in the context of mission enhancement. By taking the FEA RM taxonomy and vocabulary as a top level starting point, DoD may extend it as necessary to accommodate its own unique needs but at the same time align with a common language. This common language ensures that information may be mined and shared across lines of government as appropriate. The approach is in line with the DoD goals of making information available on a network that people depend on and trust; and to populate the network with new, dynamic sources of information to defeat the enemy.

The General Services Administration (GSA) work with TopQuadrant has demonstrated the relationships between and among the FEA RMs as well as the alignment of DoD Architecture Framework (DoDAF) with the FEA RMs. The DoD EA RMs further organizes this information by Mission Area, which promotes mission area management of enterprise information resource. This knowledge, already gained, can be applied to DoD to avoid the cost of developing such information from scratch and more quickly realize the DoD CIO goals. Such taxonomy and the ontological relationships are needed to enhance the alignment between the DoD EA and FEA RMs and contribute not only to the DoD CIO goals, but also to the President's Management Agenda to improve the efficiency and effectiveness for the citizen.

Lesson #3. Alignment of DoD work with the DoD EA/FEA BRM taxonomy and vocabulary causes a semantic interoperability problem. By reviewing Appendix C, DoD EA BRM, V.03 the reader can identify semantic differences. For example, the work described in the FEA may be found in a larger unit of DoD work, particularly for the DoD Warfighting Mission Area. Currently, while the FEA work description may be approximated in the decomposition of the Universal Joint Task List (UJTL), several layers of decomposition are needed to arrive at a closer one-to-one correspondence between the units of work being described in the FEA RMs and the DoD EA RMs extended. Advances are being internationally led by Semantic Interoperability Community of Interest (COI), particularly in the area of the Semantic Web. It is precisely this problem of semantic interoperability that this community is addressing. Again, by building on the advances of this community, DoD may be able resolve the issues of the lack of semantic interoperability sooner than later.

Lesson #4. There are DoD internal gaps and overlaps between the four Mission Areas (Warfighting, Business, Intelligence, and Enterprise Information Environment) that need to be analyzed. For example, business operations were found in the UJTLs for the Warfighting Mission Area. These business operations appear to be combat support operations and apparent duplication may need to be resolved between the more modern Business Enterprise Architecture (BEA) unit of work and the Warfighter unit of work described by the UJTL. For example, in the area of logistics, there is a Logistics sub-function for DoD from the UJTL and there is also a Logistics sub-function that fits into

the Business Mission Area. There are also overlaps between other sub-functions, such as Health and Education that need to be analyzed. It may be necessary to either extend the definitions of the FEA sub-function for the Warfighter Mission Area or to decide whether a particular sub-function should be captured in either the Warfighter or Business Mission Area exclusively. The DoD EAC CoP concluded that some overlaps are acceptable because of the nuances between DoD and other federal agency missions; definitions may need to change or be extended to allow for the nuances. In any case, more work is necessary to determine the accuracy of the mappings in these overlap areas.

2. What was learned about maintaining the RMs?

   Lesson #5. RMs provide a stable maintenance framework for increasingly higher levels of abstraction and use in changing environments. Since the DoD EAC CoP began its work in October of FY2004, the resource information in V.03 of the DoD EA RMs has changed significantly. The BEA in particular has gone through several iterations since then. V .04 of the DoD EA RMs will document an even later version of the BEA. The BEA work descriptions are the most in flux and subsequently so are the BEA service-components that support the Business Mission Area core missions. The BEA release of V3.0 will come after the publication of the DoD EA RM V. 04 and will be captured in V.05 of the DoD EA RMs. The experience gained from this change is that the RMs also proved a stable framework for aligning changes in the work and enabling technology in complex organizations.

   Lesson #6. The RM approach helps people organize complex information resources and identify gaps and additional work that is needed. The RMs are useful for organizing the information necessary to be accomplished to move the Department toward a service-oriented architecture in a net-centric environment sooner rather than later. For example, the Warfighter core mission areas are still being defined, thus affecting the relationships between the DoD EA RM Warfighting core mission areas and the UJTLs... Meanwhile, the UJTLs have remained stable regardless of the change in how they may be organized to accomplish a particular core mission. This stability at the UJTL level is documented in the DoD EA RMs, which minimizes the maintenance work between DoD EA RMs V.03 to V.04. Since the Department is moving to a service-oriented architecture in a net-centric environment, service-components to support the Warfighting Core Mission Areas or UJTLS have not yet been identified. This work remains to be done by the Warfighting community before it can be documented in the DoD EA RMs. These gaps focus the Department on work that needs to be done to advance the EA and to further EA use for improving mission results.

   The differentiation of the Intelligence Mission Area work between Warfighting and the Intelligence Mission Areas has been specified according to the recent legislation establishing the National Director for Intelligence. The legislation and collaboration with Congress regarding the intelligence functions that support the Warfighter core missions of strategic, operational and tactical defense will remain Warfighting functions, while the DoD work to support of the larger Intelligence Community headed by the National Director for Intelligence will follow along the lines currently being developed by that community. This distinction is currently documented in the DoD EA

RMs and can easily be maintained as changes occur. Intelligence service components have yet to be identified and documented for the both the Warfighting and Intelligence Mission Areas in the DoD EA RMs. When this is done, further gaps on which the Department must focus its attention to advance the EA and further EA use for improving mission results will be identified.

Lesson #7. Further, the changes to the relatively stable activities in the Net-centric Operations and Warfare Reference Model (NCOW RM) were easy to capture and document in V.04 of the DoD EA RMs. The ease of capture shows the power of a stable DoD EA RM taxonomy and its use to align the NCOW RM with the FEA RM and for ease of maintenance by the COI. The Enterprise Information Environment (EIE) Mission Area has developed activities and service components for net-centricity. These activities are documented in the appropriate DoD EA RMs. As the organization of these activities and service components changed, they were easily updated in the DoD EA RMs. The new structure of the NCOW RM that will be defined in V1.2 will be incorporated in DoD EA RMs V.05.

Lesson #8. The DoD EA TRM is stable and requires maintenance only as the DoD IT Standards Registry (DISR) on line standards change or the DoD EA/FEA Taxonomy changes. The DoD EA RMs provides a useful framework for organizing DoD DISR on-line standards from an enterprise perspective according to the FEA TRM taxonomy and vocabulary. The stability of the standards organized around a stable taxonomy facilitates use in a decentralized fashion.

Lesson # 9. DoD EA RMs enable decentralized maintenance. For example, when a Federation Member of DoD decides to change its Line of Business (LOB) and data, the change is documented in the RMs by the Federation Member according to a set of governance rules regarding configuration management of the taxonomy and vocabulary. Decentralized maintenance of the DoD EA RMs simplifies the problem of making sharable data visible in the enterprise. Documenting DoD data in the context of mission areas and organizing it by the DoD EA DRM taxonomy and vocabulary furthers the DoD CIO goal of the DoD CIO of making information available on a network that people depend on and trust. The DoD EA DRM V.04 documents business data in the context of the DoD Business Mission Area. Work has also begun to document the Warfighter data. Using the DoD EA DRM taxonomy, the Warfighter data may be made more visible and shareable from the enterprise level as well. The business context of data is not expected to change but as the FEA DRM is revised to reflect the access and sharing of information in context for not only structured data but for semi-structured and unstructured data, so will the DoD EA DRM be revised. Since DoD is influencing the FEA DRM data strategy, it is expected that the Federal strategy will be consistent with the DoD Data Strategy. Currently, the DoD EA DRM contains business data in context. The net-centric data and the Warfighter data will be added in subsequent versions. Maintenance and further development of the RMs will continue as the DoD EA PRM, in V.04 and V.05, matures with the Federal policy shifts from completion of the EA to the use of the EA for results. Maintaining the DoD EA RMs as a top-level mechanism for making information available on a network that people depend on and trust, and to accomplish other DoD CIO goals, demonstrates the Department's compliance with Office of Management and Budget (OMB) mandates for using EA for results.

3. What use do the RMs have and to whom?

   Lesson #10. The RMs can be used to identify the planned acquisition of similar technologies across the DoD EA according to some common framework. For example, they are useful for identifying the use of similar technology investments in DoD and across government to inform "Smart Buy" decisions. The RMs may also be used to help identify and catalogue cross-service COIs. The RM taxonomy and vocabulary can provide a common framework for understanding and organization of COIs in the context of the larger whole. This, for example, enables DoD to share its extensive architecture data and documentation with the rest of the Federal Government. In addition, the BRM provides a list of similar activities around which COIs can organize for government-wide improvement. An example is the Federal Health Architecture. The RMs can, when taken as a whole, among other things, facilitate standard approaches for process improvement, IT development, and joint interoperability within and among COIs and across the enterprise at large whether it is across government or within government agencies. Also when organizing by COI, RMs can be used to associate all the information resources of an enterprise such as its IT Assets, IT initiatives, and architecture, around a common taxonomy and vocabulary. This facilitates the organization of the information resource by COI LOBs or Sub functions and allows for decentralized maintenance under the governance of a centralized, agreed upon taxonomy.

   Lesson #11. The DoD EA RMs are useful to DoD Program Managers (PMs) to minimize valuable staff time on what would have otherwise been a time-consuming analysis of the FEA RMs. The DoD EA RMs provides a guide to supply required information for OMB IT300 submissions. Each IT investment must be included in the Department's EA and aligned with the FEA. By using the DoD EA RMs, the PM finds the alignment of the DoD work and technology with what FEA has already done. By using the DoD EA RM documentation, the PM shaves off valuable staff hours that would otherwise be used to perform the analysis from scratch. In addition, the top level taxonomy and ontology has utility for cross-mission area analysis to improve the efficiency and effectiveness of IT through better IT management and alignment of IT with the mission, and for assessing the impact on mission if certain technology is cut. The RMs may be used by Mission Area Managers as a common scheme for cross-mission area analysis to reduce cost (efficiency) and improve effectiveness. Mission Area Managers realize this improved efficiency and effectiveness by creating a line of sight alignment of modern information technology with the strategic outcomes of the Mission Area. Further, RMs may be used for cross-mission area analysis in the portfolio management process and may have applicability for the Mission Area Manager in the evaluation step of the portfolio management process.

   Lesson #12. RMs are useful for government-wide dialogue concerning a common language. An example of this may be seen in the recommendations for OMB's consideration. A number of items were identified in the DoD vocabulary that are not a part of the OMB vocabulary, especially when it comes to terms for network management, radio communications, and some business terms for financial management.

Another example may be seen internally. DoD mappings strengthen the alignment of DoD architectures with NCOW RM by generalizing and publishing of net-centric concepts in the context of DoD EA which includes business, data, and technology. Common understanding within DoD enables the department to put forth a more mature position in government-wide dialogue concerning the net-centric enterprise.

4. How should the RMs be governed?

Lesson #13. DoD EA/FEA RMs provide a top level taxonomy and vocabulary for decentralized implementation and content maintenance. Centralized maintenance of the ontology, taxonomy, and vocabulary is necessary under the cognizance of the DoD CIO and CIO Executive Board. Decentralized implementation and maintenance to ensure content accuracy of the information being aligned with top-level taxonomy and vocabulary, however, becomes a decentralized responsibility. Content development, change management, and maintenance must occur in a decentralized fashion and in collaboration between the COI and the DoD EA CoP, acting on behalf of the DoD CIO Executive Board. The combination of centralized and decentralized management provides a feasible means of maintaining the DoD EA RMs according to top level ontology, taxonomy, and vocabulary. This ensures that content is developed at the levels in the enterprise closest to the work and the information technology mechanisms which enable that work, and identifies where the semantic interoperability problems may be resolved.

Lesson #14. Organizational infrastructures do not exist for managing the DoD EA at the enterprise level. While organizations exist that could be used for this purpose they either are inactive or currently do not have DoD EA RM governance as a mission or function. The GIG Architecture and Integration Panel (GAIP) falls into the inactive category. The GAIP is an un-chartered, one star/SES panel that governed development of the GIG Architecture. As the GIG Architecture matured, the CIO Executive Board approved V1.0 and V2.0 and the early versions of the NCOW RM. The panel then decided its work was done and discontinued regular meetings. The DoD Architecture Framework Configuration Control Board (DoDAF CCB), consisting of representative from DoD Components, falls into the category of DoD EA RM governance "not being part of their mission and function". However, recently, the CCB had taken this matter under consideration.

Lesson #15. A common taxonomy must emerge as a the authoritative source. To ensure that a common taxonomy will emerge as the authoritative source, DoD policy needs to establish the DoD EA/FEA RM as the top-level ontology, taxonomy and vocabulary requiring the COIs, Mission Area Managers, and DoD Components to align with it to ensure that the taxonomy and vocabulary become a mechanism useful for discovering information about the Department's information resource.

Lesson #16. Roles and responsibilities need to be established for Mission Area Managers to ensure information resources are organized and aligned with the DoD EA/FEA RMs. Currently, these responsibilities are being included in the BMMP Information Resources Board (IRB) Charters. Without this pattern of

institutionalization being continued in the various governance documents in the Department, it is not likely that the full benefit of the RMs will be realized. Currently, no cross-mission area analysis is called for in the current DoD policies, thus DoD Policy needs to be crafted to ensure inter/intra cross-mission area analysis occurs. All Mission Area Managers must ensure cross-mission area analysis occurs to improve efficiency (eliminate duplication, align with Federal LOBs, and DoD and Federal "Smart Buys" etc) and effectiveness by aligning the most modern enabling technology with the strategic outcomes of the DoD Enterprise. Roles and responsibilities must also be established for the use of the DoD EA/FEA RM taxonomy and vocabulary for harmonizing the taxonomies of the DoD IT Registry with the DoD Information Technology Portfolio Repository (DITPR), SNaP IT and IT 300 Exhibits.

Lesson #17. Central management of the LOB content of the RM is not desirable or feasible. Central management of DoD EA RMs vocabulary content conflicts with DoD Policy and Philosophy. Centralized Policy and decentralized execution is the norm. Further, central management conflicts with the net-centric approach to information management. Advances in the Semantic Web improve the chances of decentralized maintenance in a Federated governance model. The Semantic Web fosters a decentralized approach to content management, thus allowing the COI or other organizational forums to resolve the semantic interoperability problems that are inherent in going from a tightly coupled systems engineered stove-piped environment to one that is more loosely coupled and includes a service oriented approach operating in a net-centric environment. Therefore, a federated approach for governance is needed.

Conclusion

The Department has begun to transform its thinking and how it operates, especially in the areas of e-government and information technology through the application of EA RMs.

In collaboration with the FEAPMO and AIC members, the DoD EAC CoP has examined the feasibility of aligning with the FEA, thus implementing presidential policy and ensuring taxpayer dollars are spent wisely to ensure improvement of government-wide mission performance, cross-mission area collaboration and to make sure IT funding is used efficiently and effectively. Toward this end the DoD EAC CoP has released all of the core references for the DoD EA RMs and is guiding the development of policy to improve the way DoD IT operates.

In doing so, the DoD EAC CoP in collaboration with the EA community government-wide, has provided leadership to:

- Improve the utilization of information resources in DoD to enhance mission performance, resulting in proactive policy and improved decision-making;
- Increase EA practice maturity DoD-wide, resulting in better alignment of IT investments with mission performance; and
- Increase cross-agency, inter-government, and public-private sector collaboration, resulting in increased common solutions and cost savings.

Because of the renewed vigor on the part of the FEAPMO, the Department can expect increased involvement on the part of DoD CIO to act on improving the practice of information resources management based on lessons learned. While these lessons learned are based on the work of producing DoD EA RMs v.03 and continued efforts to produce v.04, lessons learned will continuously be used to improve the process of DoD EA/FEA RM congruence and to improve the IT management processes and effectiveness of DoD by better aligning IT with the Secretary's Transformation Goals.